



ToYourHealth

WELCOA'S ONLINE GENERAL WELLNESS BULLETIN

Fixing Flawed Body Parts

Engineering New Tissues and Organs

How can you mend a broken heart? Or repair a damaged liver, kidney, or knee? Scientists are exploring innovative ways to fix faulty organs and tissues or even grow new ones. This type of research is called tissue engineering. Exciting advances continue to emerge in this fast-moving field.

Tissue engineering could allow doctors to repair or replace worn-out tissues and organs with living, working parts. Most important, tissue engineering might help some of the 120,000 people on the waitlist to receive donated kidneys, livers, or other organs.

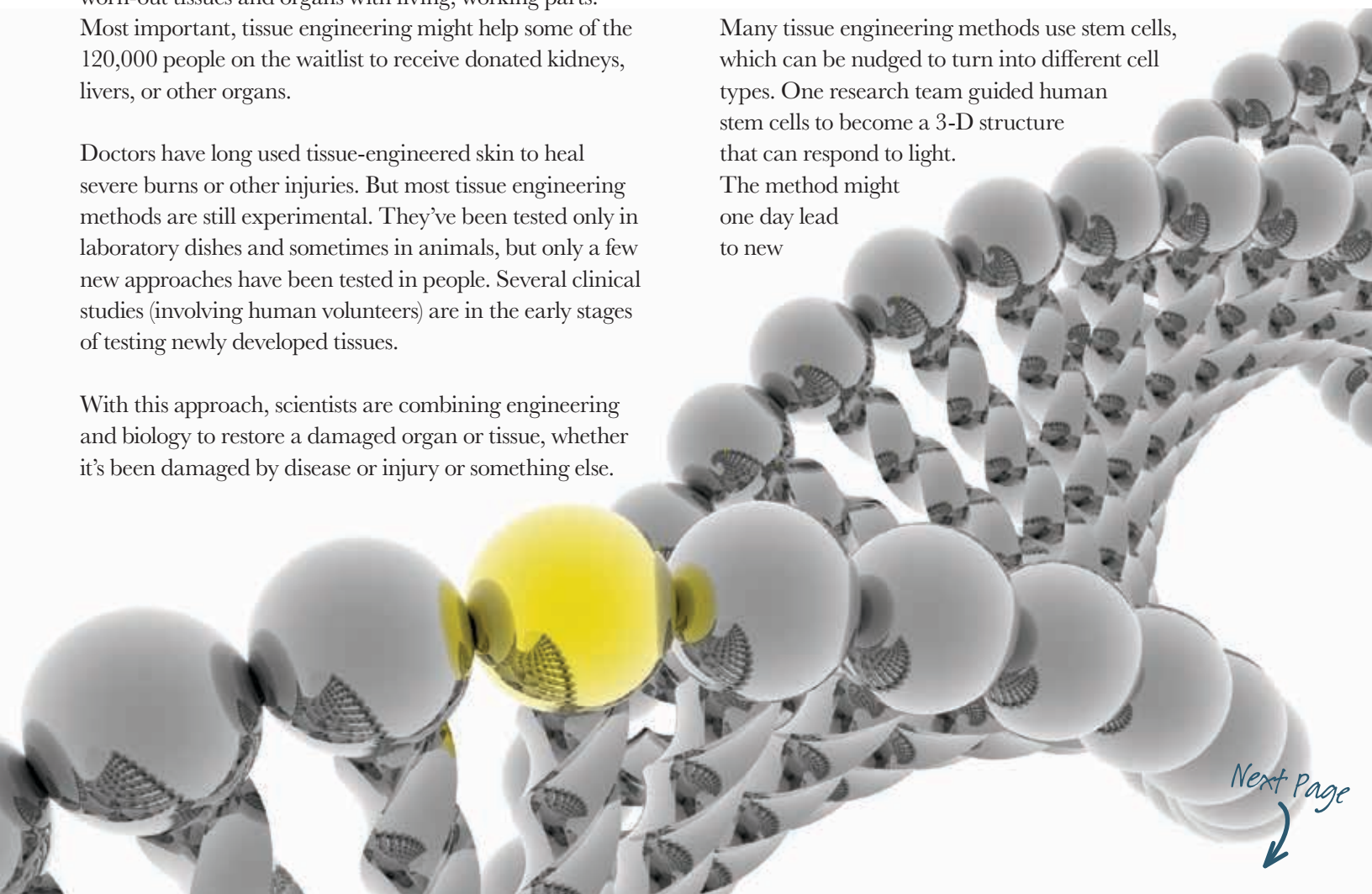
Doctors have long used tissue-engineered skin to heal severe burns or other injuries. But most tissue engineering methods are still experimental. They've been tested only in laboratory dishes and sometimes in animals, but only a few new approaches have been tested in people. Several clinical studies (involving human volunteers) are in the early stages of testing newly developed tissues.

With this approach, scientists are combining engineering and biology to restore a damaged organ or tissue, whether it's been damaged by disease or injury or something else.

Some scientists are creating special net-like structures, or scaffolds, in desired shapes and then coaxing cells to grow within them. Some use a mixture of natural substances called growth factors, which direct cells to grow and develop in certain ways.

Engineering Methods

Many tissue engineering methods use stem cells, which can be nudged to turn into different cell types. One research team guided human stem cells to become a 3-D structure that can respond to light. The method might one day lead to new



Next Page
↓



To Your Health

WELCOA'S ONLINE GENERAL WELLNESS BULLETIN

Continued from previous page

therapies for eye disorders. Other stem cell approaches may lead to improved treatment for spinal cord injuries, diabetes, and more.

Another approach, called decellularization, involves removing all the cells from an organ. What's left behind is a thin, pale framework that contains the organ's natural structural proteins, including the pathways for tiny blood vessels and nerves. By infusing new cells into this mesh-like matrix, some researchers have successfully created working animal kidneys, livers, hearts, lungs, and other organs.

The decellularization technique was used by Dr. Martin Yarmush and his colleagues to create a functional rat liver that included a network of working blood vessels. Yarmush is a biomedical engineer at Rutgers University and the Massachusetts General Hospital. The engineered livers his team created were kept alive in the laboratory for days and functioned for several hours after transplantation into rats. The researchers are now working to help those transplanted livers survive even longer. They're also scaling up the methods to create a decellularized human liver that can be repopulated with functional cells.

The new cells made their way into the damaged heart muscle and organized into muscle fibers in all of the treated monkeys. The infused stem cells replaced nearly half of the damaged heart tissue and began beating in sync with the heart. Still, the scientists note they need years of research before this type of therapy might be tried in people.

Some methods are already being tested in humans. Dr. Martha Murray, a surgeon at Boston Children's Hospital, is exploring new ways to heal a common knee injury known as a torn ACL. Athletes who do a lot of twisting and turning, as in basketball or soccer, are at risk for damaging the ACL.

After testing several biomaterials, Murray's team found that stitching a bioengineered sponge between the torn ends of an injured ACL allows blood to clot and collect around the damaged ligament. Because blood naturally contains stem cells and growth factors, the blood-soaked sponge acts as a "bridge" that encourages ACL healing. The sponge is made of some of the same proteins normally found in ligaments, and it dissolves after a few weeks.



For Healthy Organs and Tissues

The kidney is the most transplanted organ in the U.S., followed by the liver, heart, and lungs. You can protect all of your body's organs through healthy behaviors:

- › Eat a balanced diet.
- › Stay physically active.
- › Maintain a healthy weight.
- › Limit alcohol.
- › If you smoke, take steps to quit.
- › Take medications only as directed.